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ABSTRACT

Kindergarten, first, second, third and fourth grade disadvantaged Black children were given the A-State and A-Trait scales of Spielberger's State-Trait Anxiety Inventory for Children (STAIC). For the grades K-2 samples, the STAIC A-State scale was administered under two stress conditions: mathematics and communication achievement tests. The A-State scale was administered under one non-stress condition to the grades 3-4 sample. Factor analyses of the data identified three factors: trait anxiety, and two separate state anxiety factors corresponding to the reversed and non-reversed scale items. Similar factor patterns were observed for both males and females at all grade levels. These results were interpreted as providing supporting evidence for the state-trait distinction in anxiety research. (Author/BH)

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Factor Analytic Study of the State - Trait Anxiety Inventory for Children

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Abstract

Kindergarten, first, second, third and fourth grade disadvantaged black children were given the A-State and A-Trait scales of Spielberger's State-Trait Anxiety Inventory for Children (STAIC). For the K-2 samples, the STAIC A-State scale was administered under two stress conditions (mathematics and communication achievement tests). The A-State scale was administered under one non-stress condition to the 3-4 sample. Factor analyses of the data identified three factors: trait anxiety; two separate state anxiety corresponding to the reversed and non-reversed scale items. Similar factor patterns were observed for both males and females at all grade levels. These results were interpreted as providing supporting evidence for the state-trait distinction in anxiety research.

Factor Analytic Study of the State - Trait Anxiety Inventory for Children[1]

During the past decade, the literature relating anxiety to school performance has established that high levels of anxiety are generally associated with performance decrements in the classroom (Sarason, 1972; Spielberger, 1966; 1972; 1975), even in individualized instructional environments (Papay, Costello, Hedl, & Spielberger, 1975). It is important to differentiate children according to their level of anxiety because it is these children who are high in anxiety proness who are likely to experience difficulty in school-related situations. And, it is the high anxious children who often require special instructional activities (Spielberger, 1972). Consequently, early identification of anxiety proneness can often enhance the effectiveness of intervention strategies (Phillips, Martin & Meyers, 1972).

In contrast to the Children's Manifest Anxiety Scale (Castaneda, McCandless & Palermo, 1956) and the General Anxiety Scale for Children (Sarason, Davidson, Lighthall, Waite & Ruebush, 1960), the State-Trait Anxiety Inventory for Children (STAIC) (Spielberger, 1973) consists of separate self-report scales for both trait and state anxiety. The STAIC was originally normed for research and evaluation purposes with fourth, fifth, and sixth grade children. Papay et al. (1975) and Papay and Hedl (1978) have provided evidence concerning the reliability and construct validity of the STAIC with lower-class disadvantaged children across grades K-4. Little is known, however, concerning the factor structure

of the STAIC for these particular types of children.

Studies of the properties of the STAIC A-State and A-Trait scales (Spielberger, 1973) have demonstrated that both scales have a high degree of internal consistency. The A-State scale has KR-20 coefficients from .82 to .87 while the A-Trait scale's are from .78 to .81. The A-Trait scale has a higher test-retest reliability, as expected theoretically. Spielberger (1973) reported test-retest coefficients from .65 to .71 for the A-Trait scale and .31 to .47 for the A-State scale. These data are consistent with the design of the two scales. The A-State scores should measure variation in different stress situations while the A-Trait scores should reflect a more stable characteristic.

If the A-State scale was given on more than one occasion and the results factor analyzed, then its high item homogeneity and low stability should lead to a separate, but related item cluster each time it was administered. Conversely, the high item homogeneity and stability of the A-Trait scale should produce only one item cluster. It was predicted that four factors would be extracted for the K-2 sample including one trait anxiety factor and two A-State clusters corresponding to each administration. A reversed item A-State factor was predicted based upon the findings of Gaudry, Vagg and Spielberger (1975). The prediction was for three factors in the 3-4 sample since the A-State scale was only administered once. These data were analyzed separately by sex and grade level.

Method

Subjects

The sample consisted of 1,786 K-4 grade black elementary school children from a large metropolitan school district randomly selected from 30 Title I schools. From kindergarten 48 males and 62 females were tested. In the first grade 106 males and 117 females were tested. From the second grade 95 males and 106 females were tested. In the third grade there were 275 males and 285 females. 338 males and 354 females were tested from the fourth grade.

Procedure

Children in the K-2 grades were tested individually or in small groups of 5-6 during the last two months of the academic year. Test examiners were experienced substitute teachers. At the beginning of the testing session, the examiner explained that she was going to ask some questions about school work. The STAIC A-Trait scale was then read to the child(ren) with standard instructions. Next the children were given a communications task and a mathematics task which were administered in a counterbalanced order across the sample. Following each task, the STAIC A-State scale was given using retrospective instructions; that is, the children were asked to report how they felt while working on the task.

The third and fourth graders were tested with the STAIC A-State and A-Trait scales under large group procedures by experienced examiners. The students were instructed to respond according to "how you feel right now, at this moment" for the A-State scale.

Results

For the K-2 sample, the intercorrelations were computed among the 58 variables: the 18 STAIC A-Trait items[2] and the 40 A-State items. All analyses were computed separately by sex and grade level. These data were factor analyzed, using a principal axis solution with squared multiple correlations as estimates of the communalities. The number of factors with eigenvalues greater than 1.0 extracted for these six groups ranged from 14-18. For each of the six groups a scree plot (Cattell, 1966) of these eigenvalues indicated three or four major factors, and these numbers of factors were rotated by Kaiser's (1958) Varimax. Although the study had hypothesized four factors, it was thought desirable to review other solutions because the nature of the factor analytic method allows the production of spurious or error factors during extraction and rotation. If we had only reviewed the four factor solution we may have included one of these factors.

After reviewing 2, 3, 4, and 5 varimax rotated factors for all six groups the author decided on three factors because this solution most clearly defined the factors. Tables 1 and 2 present the varimax three-factor solutions for the females and males, respectively. All factor loadings of .30 or greater are given in the form, S1(1) 35, which signifies (See Table 1) a loading of .35 for the first item of the A-State scale on its first administration. S2 would indicate the second administration.

Insert Tables 1 and 2 about here

Factor 1 consisted primarily of the items from the A-State scale from both administrations that are scored in the reversed direction (e.g., item 19 "I feel cheerful"). Factor II consisted exclusively of the non-reversed A-State items from both administrations stated in the form, "I feel worried". Factor III was defined as a trait anxiety factor which was loaded by the majority of the STAIC A-Trait items. The order or extraxtion for these three factors varied slightly across the six groups. However, the similarity of the factor patterns for both males and females in grades K-2 was marked. Contrary to prediction, an A-State factor associated with the two different occasions of measurement was not observed in any of the factor solutions.

In the two-factor varimax rotation, the two A-State factors emerged with a loss of the trait anxiety factor. The four - and five factor rotation solutions tended to fragment the patterns shown in Tables 1 and 2.

It was not possible to gather data on the A-State scale measures under an evaluative testing session for the 3-4 samples and one less factor was predicted accordingly. As with the K-2 data, analyses were computed separately by sex and grade level. The 20 items from the administration of the STAIC A-Trait scale and the full 20 items from the A-State scale were factor analyzed in a manner similar to the K-2 data. Principle axis factors were extracted for the four groups and scree plots of the eigenvalues were individually reviewed. Two-, three-, four-, and five-factors were rotated by varimax to check the accuracy of extraction and rotation.

Insert Tables 3 and 4 about here

Tables 3 and 4 show the varimax three-factor solutions for the females and males in grades 3-4, separately. Similarly to the K-2 groups, Factor I consisted of the items scored in the reversed direction ("I feel cheerful"). Factor II was associated with the A-State items in the form, "I feel worried". Factor III was defined by trait anxiety items.

The two-, four-, and five-factor solutions yielded results similar to the K-2 data.

The means and standard deviations of the STAIC A-State scores are presented in Table 5. As may be noted, these

Insert Table 5 about here

males and females showed rather similiar levels of A-State in the communications and mathematics tasks.

Discussion

The results of this study provide evidence of the importance of the state-trait distinction in anxiety which was first identified by Cattell and Scheier (1961) and subsequently refined and operationalized by Spielberger (1966; 1972; 1975). Across five grade levels, sex, and testing conditions, two separate A-State factors emerged, each associated with the reversed and non-reversed scale items. In addition, an A-Trait factor emerged separate from the A-State factors.

A reversed item factor was an unexpected finding in the Gaudry et al. (1975) study using the STAIC with high school and university students. In constrast, a reversed item factor was consistently observed across both sexes and five grade levels with the STAIC. Gaudry et al. (1975) noted that the reversed and non-reversed items of the STAIC behaved differently as mean stress levels increased. The non-reversed items showed a high ceiling effect in that these items showed little change in mean or variance until the situations became more stressful. The reversed items were found to be more sensitive at all levels of stress. Since the two measurement periods in the present study showed similar levels of A-State, it was not possible to evaluate this possibility with the STAIC. These STAIC findings, however, suggest that the disadvantaged black children responded to the two item formats in consistent ways.

The only unexpected finding was the failure to observe separate A-State factors associated with the different occasions of measurement for the K-2 children. Generally, the reversed items from both scale administrations loaded on the same factor, as was true for the non-reversed A-State items. It is quite possible that the K-2 students were responding to the situation as a whole and were not distinguishing among the separate sessions in responding to the items. They completed the A-State scales at two different times within the same testing session. Examination of the A-State means for the mathematics and communications tests indicated relatively equivalent mean levels of

anxiety for each of the tasks (See Table 5). The Gaudry et al. (1975) study which found separate factors for occasions used both an older sample and testing sessions that were separated by several weeks in each instance. A-State scores were also found to vary significantly across the conditions.

The consistency of the findings is especially noteworthy when one considers the similarity of the factor structures of the STAIC across types of testing conditions (individual vs. small group), sex, and grade levels (K-4). Differences arose more from the magnitude of loadings of items on factors than from the organization of factors. Given these differences in subject characteristics and procedures, differences in factorial structure would normally be expected. The fact that the structures were quite consistent for these children suggests the generality of the state-trait distinction across grade levels and suggests the usefulness of the STAIC in research on anxiety and school-related problems.

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Footnotes

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2. Items 7 and 15 of the STAIC A-Trait scale were deleted from the original data collection for the K-2 data. These items ("I get upset at home" and "I worry about my parents") were deleted by the research review committee of the school district as dealing with sensitive areas of the home environment.

Table 1

Varimax Factor Loadings for Female Students in Grades K-2

Factor	Grade Levels								
	Kindergarten			First			Second		
	I	II	III	I	II	III	I	II	III
	T(10) 36		T(1) 63				T(12) 35		T(2) 51
	S1(1) 35	S1(8) 44	T(2) 69	S1(1) 53	S1(2) 44	T(1) 54	S1(1) 65	S1(2) 69	T(3) 38
	S1(2) 40	S1(12) 48	T(3) 58	S1(3) 57	S1(4) 70	T(2) 61	S1(3) 65	S1(4) 60	T(6) 68
	S1(4) 62	S1(13) 53	T(4) 62	S1(6) 57	S1(5) 45	T(3) 41	S1(6) 57	S1(5) 57	T(8) 45
	S1(5) 60	S1(14) 49	T(5) 62	S1(8) 63	S1(7) 57	T(4) 59	S1(8) 67	S1(7) 70	T(9) 61
	S1(6) 35	S1(17) 47	T(6) 50	S1(10) 41	S1(9) 62	T(5) 54	S1(10) 67	S1(9) 58	T(10) 52
	S1(7) 57	S1(20) 59	T(8) 23	S1(12) 68	S1(11) 61	T(6) 62	S1(12) 62	S1(11) 63	T(11) 34
	S1(9) 60		T(9) 65	S1(13) 75	S1(15) 57	T(8) 52	S1(13) 60	S1(15) 52	T(12) 64
	S1(10) 38	S2(3) 55	T(10) 67	S1(14) 71	S1(16) 66	T(9) 58	S1(14) 66	S1(16) 58	T(13) 30
	S1(11) 74	S2(5) 37	T(11) 32	S1(17) 65	S1(18) 72	T(10) 53	S1(17) 56	S1(18) 48	T(14) 58
	S1(15) 63	S2(8) 54	T(12) 70	S1(20) 50	S1(19) 71	T(11) 29	S1(20) 63	S1(19) 41	T(16) 35
	S1(16) 73	S2(10) 51	T(13) 51		S1(20) 32	T(12) 51			T(17) 54
	S1(18) 41	S2(12) 59	T(14) 68			T(13) 32	S2(1) 45	S2(2) 67	T(19) 41
	S1(19) 74	S2(13) 43	T(16) 48	S2(1) 59	S2(2) 63	T(14) 58	S2(3) 63	S2(4) 52	T(20) 51
		S2(14) 61	T(17) 46	S2(3) 62	S2(4) 72	T(16) 47	S2(6) 56	S2(5) 51	
	S2(2) 55	S2(17) 53	T(18) 32	S2(6) 54	S2(7) 81	T(17) 60	S2(8) 57	S2(7) 66	
	S2(4) 55	S2(20) 49	T(19) 42	S2(8) 56	S2(9) 63	T(18) 49	S2(10) 68	S2(9) 65	
	S2(5) 60		T(20) 45	S2(10) 51	S2(11) 60	T(19) 50	S2(12) 65	S2(11) 65	
	S2(6) 42			S2(12) 66	S2(15) 56	T(20) 52	S2(13) 57	S2(15) 58	
	S2(7) 52			S2(13) 71	S2(16) 63		S2(14) 65	S2(16) 67	
	S2(9) 34			S2(14) 67	S2(18) 61		S2(17) 66	S2(18) 60	
	S2(11) 65			S2(17) 55	S2(19) 51		S2(20) 66	S2(19) 65	
	S2(15) 74			S2(20) 68					
	S2(16) 59								
	S2(19) 59								
% Total Variance	18.0	7.0	11.2	18.3	16.7	6.1	13.7	17.0	7.1

To facilitate discussion of the results, the three factors are reported in the same logical order in this and subsequent tables rather than in the order of their extraction for each grade. The order of extraction is reflected in the % variance accounted for by each factor.

The reversed items for A-State are 2, 4, 5, 7, 9, 11, 15, 16, 18, 19.

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Table 2

Varimax Factor Loadings for Male Students in Grades K-2

Factor	Grade Levels								
	Kindergarten			First			Second		
	I	II	III	I	II	III	I	II	III
	T(7) 40	T(12) 32	T(2) 46	S1(2) 43	S1(1) 43	T(1) 49	S1(2) 42	S1(1) 51	T(1) 48
	T(16) 40		T(3) 40	S1(4) 53	S1(3) 59	T(2) 59	S1(4) 54	S1(3) 74	T(2) 53
		S1(1) 30	T(4) 65	S1(5) 51	S1(6) 44	T(3) 47	S1(5) 53	S1(6) 67	T(3) 34
	S1(2) 60	S1(3) 65	T(5) 42	S1(7) 72	S1(8) 50	T(4) 60	S1(7) 64	S1(8) 72	T(4) 45
	S1(4) 53	S1(8) 63	T(6) 39	S1(9) 63	S1(10) 62	T(5) 51	S1(9) 60	S1(10) 49	T(5) 40
	S1(5) 45	S1(10) 42	T(8) 49	S1(11) 57	S1(12) 75	T(6) 59	S1(11) 68	S1(12) 66	T(6) 61
	S1(7) 74	S1(12) 67	T(9) 62	S1(15) 47	S1(13) 63	T(8) 62	S1(15) 50	S1(13) 56	T(8) 44
	S1(9) 51	S1(13) 74	T(10) 59	S1(16) 68	S1(14) 63	T(9) 71	S1(16) 54	S1(14) 60	T(9) 62
	S1(10) 43	S1(14) 71	T(11) 64	S1(18) 65	S1(17) 61	T(10) 58	S1(18) 63	S1(17) 57	T(10) 33
	S1(11) 81	S1(17) 62	T(12) 64	S1(19) 65	S1(20) 52	T(11) 32	S1(19) 54	S1(20) 60	T(12) 41
	S1(15) 56	S1(20) 39	T(13) 39			T(12) 58			T(14) 49
	S1(16) 59		T(14) 42	S2(2) 67	S2(1) 48	T(13) 53	S2(2) 81	S2(1) 63	T(17) 35
	S1(18) 33	S2(1) 40	T(16) 55	S2(4) 65	S2(3) 66	T(14) 65	S2(4) 68	S2(3) 68	T(18) 38
	S1(19) 57	S2(3) 43	T(17) 61	S2(5) 69	S2(6) 51	T(16) 48	S2(5) 69	S2(6) 63	T(19) 52
		S2(8) 41	T(19) 60	S2(7) 61	S2(8) 53	T(17) 49	S2(7) 82	S2(8) 72	T(20) 55
	S2(2) 73	S2(10) 55	T(20) 60	S2(9) 61	S2(10) 48	T(18) 44	S2(9) 56	S2(10) 60	
	S2(4) 34	S2(12) 61		S2(11) 68	S2(12) 61	T(19) 64	S2(11) 75	S2(12) 61	S1(14) 33
	S2(7) 34	S2(13) 58		S2(15) 50	S2(13) 59	T(20) 58	S2(15) 43	S2(13) 58	S1(17) 38
	S2(8) 31	S2(14) 73		S2(16) 68	S2(14) 70		S2(16) 63	S2(14) 60	S2(10) 34
	S2(9) 35	S2(17) 73		S2(18) 49	S2(17) 62		S2(18) 69	S2(17) 69	
	S2(11) 63			S2(19) 60	S2(20) 47		S2(19) 54	S2(20) 41	
	S2(15) 42			S2(20) 36					
	S2(16) 54								
	S2(18) 33								
	S2(19) 71								
% Total Variance	14.9	14.5	5.3	16.8	15.9	7.4	15.1	19.1	5.8

Table 3

Varimax Factor Loadings for Female Students in Grades 3-4

	Grades					
	Three			Four		
Factor	I	II	III	I	II	III
	S(2) 48	S(3) 43	T(5) 34	S(2) 58	S(1) 36	T(6) 42
	S(4) 56	S(6) 31	T(6) 37	S(4) 42	S(6) 40	T(10) 44
	S(5) 41	S(8) 42	T(7) 31	S(7) 61	S(8) 49	T(13) 34
	S(7) 66	S(10) 43	T(9) 37	S(9) 62	S(10) 34	T(19) 33
	S(9) 65	S(12) 58	T(14) 45	S(11) 66	S(12) 62	T(20) 40
	S(11) 66	S(13) 43	T(20) 43	S(15) 44	S(14) 62	
	S(15) 64	S(14) 61		S(16) 51	S(17) 56	
	S(16) 59	S(17) 46		S(18) 39	S(20) 35	
	S(18) 54			S(19) 56		
	S(19) 63					
% Total Variance	11.2	8.3	5.1	11.7	6.3	5.3

Table 4

Varimax Factor Loadings for Male Students in Grades 3-4

Factor	Grades: Three I	Three II	Three III	Four I	Four II	Four III
	S(2) 59	S(1) 50	T(2) 43	S(2) 58	S(1) 40	T(1) 36
	S(4) 51	S(3) 54	T(4) 40	S(4) 53	S(3) 41	T(2) 37
	S(7) 66	S(6) 39	T(5) 35	S(5) 33	S(6) 37	T(4) 39
	S(9) 62	S(8) 55	T(6) 41	S(7) 71	S(8) 49	T(6) 40
	S(11) 65	S(10) 52	T(7) 36	S(9) 68	S(10) 46	T(9) 36
	S(15) 63	S(12) 61	T(8) 35	S(11) 69	S(12) 56	T(10) 43
	S(16) 57	S(13) 47	T(9) 44	S(15) 54	S(13) 34	T(13) 30
	S(18) 57	S(14) 55	T(10) 43	S(16) 57	S(14) 62	T(14) 42
	S(19) 59	S(17) 55	T(11) 30	S(18) 58	S(17) 64	T(20) 32
		S(20) 30	T(12) 39	S(19) 57	S(20) 41	
			T(14) 38			
			T(16) 30			
			T(18) 36			
			T(19) 34			
			T(20) 34			
% Total Variance	11.0	9.5	6.9	12.8	7.8	5.5

Table 5

Means, Standard Deviations and t values of the STAIC A-State Scores for K-2

Grade Levels	Tasks: Communications	Tasks: Mathematics	t	Significance
Kindergarten				
Males (N=48)				
$\bar{X}$	33.73	34.19	-.81	N.S.
SD	4.86	5.21		
Females (N=62)				
$\bar{X}$	34.97	34.71	.53	N.S.
SD	4.81	3.82		
First Grade				
Males (N=106)				
$\bar{X}$	33.17	33.35	-.51	N.S.
SD	5.49	5.33		
Females (N=117)				
$\bar{X}$	34.10	33.99	.34	N.S.
SD	5.60	5.61		
Second Grade				
Males (N=95)	32.56	33.17	-2.46	N.S.
$\bar{X}$	5.51	5.93		
SD				
Females (N=106)				
$\bar{X}$	31.90	31.42	1.28	N.S.
SD	5.83	5.96		